REMARKS / ARGUMENTS

The Office Action of December 20, 2002 rejected claims 2-6 and claims 22-37 under 35 U.S.C. s 103(a) as being unpatentable over Cheng (U.S. 6,014,256) in view of Konno et al. (JP 04335304). Claims 2-6 and 22-37 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Cheng (U.S. 6,014,256) in view of Konno et al. (JP04335304). By this paper, claims 1-56 have been canceled and new claims 57-80 have been added. The new claims 57-80 are directed to the same species as canceled claims 2-6 and 22-37. For reasons discussed below, new claims 57-80 are not obvious over Cheng in view of Konno and favorable action is respectfully requested.

The present invention relates to an optical polarization beam splitter that can split an optical beam into two components or combine two components into a single optical beam. As a light splitter, light emerging from a first optical fiber is collimated by a collimating lens. The collimated beam is focused by a focusing lens on a birefringent crystal that separates the collimated beam into a first component and a second component that enter second and third optical fibers, respectively. In reverse, two light components are combined into a single beam.

The Examiner directs Applicants to Konno to address the lack of a teaching by Cheng of the use of a birefringent walk-off crystal having a first face at an angle to reduce an optical reflection. Claim 57 recites that a thickness of the birefringent crystal and an angle of a first face of the crystal to the first optical axis are selected such that a walk-off distance of the crystal substantially matches a spacing between the second and third optical fibers. Advantageously, this permits close spacing of the second and third optical fibers and avoids the use of longer walk-off distances that would otherwise be required to provide sufficient beam spacing to accommodate the physical sizes of the optical components.

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Konno only indicates that its purpose is to "omit optical axis adjustment and to obtain low reflection loss . . ." *See* Abstract:Purpose. The abstract of Konno does not teach or suggest using the <u>thickness</u> of a crystal and <u>the orientation of a face of the crystal</u> to <u>select a walk-off distance</u> of the crystal. As noted by the Examiner, Cheng does not teach the use of a birefringent walk-off crystal having a first face at an angle to said first optical axis. For at least these reasons, claim 57 overcomes the cited and is believed to be in condition for allowance, which is respectfully requested. Independent claims 62. 67, 73, and 78 also over come the cited art for at least these reasons and are believed to be in condition for allowance.

Claim 57 recites both a collimating lens and a focusing lens and the Examiner states that "as for the use of two lenses, one for collimating and one for focusing, it would have been obvious to one having ordinary skill in the art . . . to have modified the device of Cheng such that it include, as set forth in the claims, both a collimating lens and a focusing lens . . ."

Applicants respectfully traverse this rejection. From the examples of Figures 1 and 2 in Cheng, one of skill in the art would be unlikely to substitute two lenses for one lens. In Cheng, Figures 1 and 2 illustrate that the diameter of the lenses of an optical splitter/coupler have spatial requirements that impact the size of the device. Figure 1 utilizes two adjacent lenses 12a and 12b. Cheng teaches that "since GRIN lenses 12a and 12b each have a diameter d_1, and there is some adjustment/tuning space d_2 between the lenses 12a and 12b, the crystal must have a width to accommodate the sum of the lengths $S = d_1 + d_2 + d_1$." *See* col. 3, lines 31-36. Figure 2 of Cheng illustrates a non-working embodiment where "sufficient space to place the lenses 12a and 12b is not available. *See* col. 3, lines 42-43. In other words, "the requirement to use lenses that will collimate light propagating through the crystal 10, places a constraint on using a crystal that

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is sized to at least accommodate two lenses or collimated beams of light." *See* col. 3, lines 44-48.

After discussing the disadvantages of using two or more lenses, Cheng further states, with respect to Figure 3a, that "only one lens is required in the first embodiment of the invention . . ." *See* col. 3, lines 59-61. Cheng states that the cost savings of manufacturing the device of Figure 3a is substantially less than the conventional beam splitter of Figure 1. For these reasons, Cheng teaches away from using a two lenses and one of skill in the art would not substitute two lenses for a single lens in view of the teachings of Cheng.

The Examiner further indicates that the specific dimensions and separations recited in the claims would be obvious to one of having ordinary skill in the art in view of Cheng. Applicants respectfully traverse this rejection for at least the following reasons. Cheng teaches that "for optimum coupling to exist, and for the input and optical waveguides to have their optical axes parallel with the optical axis of the coaxial lenses, the following relation ship should exist: $l_1 \approx l_2 \approx 0.5 \, l_3$ as illustrated in Figure 3d. *See also* col. 5, lines 57-60. Cheng further teaches that, without this relationship, "light does not couple efficiently into the waveguide." *See* col 5. lines 42-45. As noted above, this teaching is implemented in the embodiment of Figure 3d. In contrast, embodiments of the present invention are not bound by spatial relationships taught by Cheng and are therefore not obvious in view of Cheng.

For at least these reasons, independent claims 57, 62, 67, 73, and 78 overcome the cited art and are in condition for allowance. The dependent claims depend from one of the independent claim and in condition for allowance for at least this reason. In view of the foregoing, this application is believed to be in condition for allowance and favorable action is

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respectfully requested. In the event of any question, the Examiner is respectfully requested to initiate a telephone conversation with the undersigned.

Dated this 8th day of October 2003.

Respectfully submitted,

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